

## REMARKS

Applicant appreciates the consideration shown by the U.S. Patent Office, as evidenced by the October 26, 2007 Office Action. Claims 1-56, and 67-76 had been cancelled and claim 57 has been amended. As such, claims 57-66, 77-92, and 100-120 remain in the case.

The October 26, 2007 has been carefully considered. Applicant respectfully requests reconsideration of the application by the Examiner in light of the above amendments and the following remarks.

During an Examiner Interview on December 6, 2007, patentability of the claims as presented herein over the cited references was discussed. Applicants respectfully appreciate the time given for the Examiner Interview.

The Office Action rejected Claims 1-92 and 100-120 under 35 U.S.C. 103(b) as allegedly anticipated by Vierheilg U.S. Patent 6,028,023) ('023) alone or as further evidenced by Stamires et al 20020110520 A1) and in the alternative as obvious over Vierheilg (U.S. Patent 6,028,023) alone in view Stamires.

### **Novelty and Non-obviousness regarding Independent Claims 57, 77, 100, and 104**

Independent claims 57, 77, 100, and 104 are novel and non-obviousness because the reference, individually or combined, do not disclose methods of using a mixed metal oxide having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees in general and not in an FCC unit.

To anticipate under §102, a single reference must teach *every aspect* of the claimed invention. References cannot be combined to prove an anticipation rejection. In this case, assuming arguendo, even if the '023 and Stamires references are combined, the combined references do not disclose using a mixed metal oxide having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees in general and do not disclose using the mixed metal oxide in an FCC unit to reduce the concentration of sulfur in gasoline. The references '023 and Stamires, either individually or combined only disclose using an hydrotalcite like compound (HTL i.e. also referred as and known to one of ordinary skill in the art as 'mixed metal hydroxide' as shown by but not

limited to the cited '023 reference. Col 1 lines 63-Col 2 line 17) and do not disclose method of using a mixed metal oxide to reduce the concentration of sulfur in gasoline. Stamires does not even disclose the mixed metal oxide having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees.

To establish a prima facie case of obviousness, according to MPEP and past and recent case law, it is and still remains *necessary* for the Examiner to demonstrate a motivation to modify, some reason that would lead **one of ordinary skill in the art** modify a **known prior art**. Takeda Chemical Industries, Ltd. v. Alphapharm Pty., Ltd. 06-1329 Fed. Cir. 2007. Allegations of 'obvious to try' are not sufficient if "the situation presented was not one with a **finite number of identified, predictable solutions.**" Id. Thus, an Examiner must necessarily identify some reason that would have led one of ordinary skill in the art to make the modification.

An applicant is allowed to be his own lexicographer and has chosen to refer to the compound having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees by the lexicon i.e. name of **mixed metal oxide** (also referred as "mixed metal oxide") and has defined the mixed metal oxide with reasonable efforts in several places in this application as filed, such as but not limited to paragraphs 10, 23, 55, 56, and 57 and also distinguished the mixed metal oxide from a hydrotalcite like compound (HTL i.e. mixed metal hydroxide.)

[0010] "The invention also provides methods for reducing sulfur in gasoline by adding gasoline sulfur reduction additives comprising **mixed metal oxide compounds, also referred to as mixed metal oxides of hydrotalcite like compounds, to an FCC unit**"

[0055] The mixed metal oxide compound can be a magnesium aluminate compound or can be in the form of a solid solution. In one embodiment, the mixed metal oxide is a mixed metal oxide to a hydrotalcite like compound.

Furthermore, this application as filed includes and refers to **mixed metal oxide** described in U.S. Patent No. 6,028,023:

[0032] Methods for making these mixed metal oxide compounds are described in U.S. Patent Nos. 6,028,023 and 6,479,421, the disclosures of which are incorporated by reference herein in their entireties.

Moreover, the Office Action even admits that '023 is silent as to reducing sulfur in gasoline produced in an FCC unit using the mixed metal oxide. The references themselves also disclose using hydrotalcite-like compound in an FCC unit, while failing to disclose using a mixed metal oxide in an FCC unit. For example, the '023 discloses using HTL (i.e. mixed metal hydroxide) in an FCC unit and distinguishes HTL from the mixed metal oxide while remaining silent regarding method of using the mixed metal oxide such as but not limited to:

"Applicant's overall invention is primarily based upon a two step "activation" procedure that is generally comprised of heat treating and then hydrating certain hereinafter described **hydrotalcite-producing, mixed metal oxide compounds**"

"Applicant's invention has two general embodiments. The first embodiment is a method for producing HTL compounds (e.g., anionic clay compounds, hydrotalcite per se, and various hydrotalcite-like compounds) from compounds that do not possess the structural characteristics of HTL compounds. ....

"Temperatures at the upper end of applicant's 300°-850°C. range, such as temperatures ranging from about 700°-850°C., are less preferred since various less desirable phases (hereinafter more fully described) may result from heating **applicant's mixed metal oxide, synthesis reaction products to such levels**. The formation of these less desirable phases may diminish the mixed metal oxide material's potential to form maximum amounts of the HTL-containing phases that are the object of applicant's processes."

(Col. 7 line 57- Col. 9 line 4)

"Because the HTL compounds of this patent disclosure are harder than HTL compounds made by prior art processes, they present a method whereby the useful life of a catalyst or sorbent system (such as those employed in FCC units or fixed bed units) can be extended. This extension of a catalyst's (or sorbent's) useful life will take place when the HTL compounds of this patent disclosure are used in their own right, e.g., as hydrocarbon cracking or forming catalysts, SO<sub>x</sub> sorbents, etc., or when these HTL compounds are used as binders, matrices, supports, or carriers for other catalytically active materials ..."

( Col. 15 lines 19-27)

Mixed metal oxide has multiple unexpected benefits and characteristics which differ from an HTL, calcined HTL, or precursor of Stamires thereby showing that the mixed metal oxide is not the same composition.

X-ray diffraction pattern

'023 patent states:

"FIG. 5 shows the changes in crystal structure at various steps in applicant's "activation" process. The top two curves in this plot (respectively labeled "2Mg/1Al Mixed metal oxide before heat aging" and "2Mg/1Al Mixed metal oxide after heat aging") already have been discussed as part of the previous discussion of FIGS. 1 to 4. The trace in FIG. 5 labeled "heat treated" is representative of the observed phases of HTL structures following Step 1 of applicant's activation process. The trace labeled "heat treat+hydrate (activated HTL)" depicts the results of Step 2 of applicant's activation process. Clearly, an HTL structure has been created. This is evidenced by the presence of all major peaks of an HTL compound, including peaks at about 11.271 degrees, 22.700 degrees and 34.358 degrees manifesting their presence. It also should be noted that FIG. 5 includes the effects of the CeO.sub.2 component that was added during the synthesis reaction and whose most prominent peaks manifest themselves at 28.555 degrees, 47.479 degrees and 56.335 degrees." (Col. 19 line 26-45)

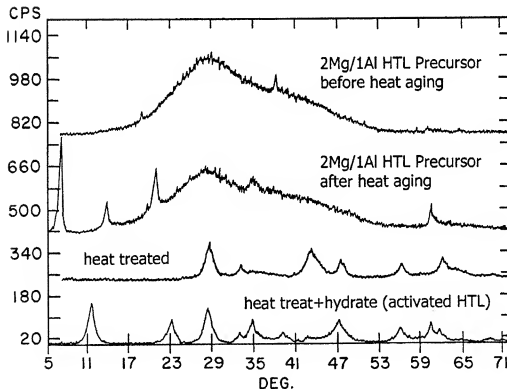


Fig. 5 of '023 reference shows that the 3<sup>rd</sup> graph from top labeled 'heat treated' is the x-ray diffraction (XRD) pattern of the mixed metal oxide having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees while the 4<sup>th</sup> graph labeled "heat treat+hydrate (activated HTL)" is the XRD of the resulting HTL structure (i.e. mixed metal hydroxide). Thus, '023 reference Fig. 5 shows that the **mixed metal oxide** has an XRD pattern which differs from the resulting HTL (i.e. mixed metal hydroxide) 4<sup>th</sup> graph, the XRD graphs 1<sup>st</sup> and 2<sup>nd</sup>, and Stamires' so called precursor. Thus, mixed metal oxide is not the same composition as HTL (i.e. mixed metal hydroxide) or precursor of Stamires.

An applicant is allowed to be his own lexicographer. In this case, the name or lexicon of the compound having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees which applicant refers as **mixed metal oxide** may sound similar in lexicon to **mixed metal hydroxide** (i.e. also referred as HTL.); however, the mixed metal oxide and mixed metal hydroxide are not the same compositions as demonstrated by various characteristics such as XRD, etc.

In other words, HTL is also referred as and known to one of ordinary skill in the art as '**mixed metal hydroxide**' as shown by but not limited to the cited '023 reference. (Col 1 lines 63-Col 2 line 17) which may sound similar in nomenclature to applicant's **mixed metal oxide** having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees in this pending application. However, the application as filed shows that the **mixed metal oxide** has various different characteristics from an HTL (i.e. **mixed metal hydroxide**) or calcined HTL, such as XRD discussed above, and degree of gasoline sulfur reduction, product yield, and yield shift, and hence are not the same composition. Each characteristic independently refute that the present claims are obvious.

Stamires fails to provide the missing motivation as Stamires does not even disclose the mixed metal oxide (i.e. precursor) having the X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degree in applicant's pending application. As known, applicant is allowed to be his own lexicographer and Stamires calls his compound a 'precursor' but is not same precursor (i.e. mixed metal oxide) as applicant's. In other words, both Stamires and applicant (we) in this pending application have chosen to refer to their respective compounds by the lexicon i.e. name of 'precursor'; however,

the compound which Stamires calls a precursor is not same precursor as applicant's as demonstrated by various differing characteristics such as XRD having the X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degree, etc.

The application as filed shows that applicant's precursor i.e. mixed metal oxide has various different characteristics from an HTL, calcined HTL, or Stamires' mixed metal oxide, such as XRD discussed above, and degree of gasoline sulfur reduction, product yield, and yield shift, and hence are not the same composition. Each characteristic independently refute that the present claims are obvious. For example, gasoline sulfur reduction of using Example 1 additive B which is an embodiment of the methods of using mixed metal oxides of this invention, reduced gasoline sulfur (9.6) more than the collapsed HTL of additive A and C in example 1. Example 1 additive D is also an embodiment of using mixed metal oxide of this invention which reduced gasoline sulfur. Thus, embodiments of methods of using mixed metal oxides of the present invention are useful to reduce gasoline sulfur. Additionally, Table 2 and Table 3 paragraph 74 of this application as filed provides further support that the mixed metal oxide has other different characteristics from an HTL or calcined HTL, such as product yield, and yield shift. Thus, the application as filed shows that mixed metal oxide has multiple different characteristics from an HTL or calcined HTL, such as, but not limited to, X-ray diffraction pattern, degree of gasoline sulfur reduction, product yield, and yield shift.

#### Attrition Index and ABD

The mixed metal oxide has more characteristics from an HTL or calcined HTL, each characteristic which independently refute that the present claims are anticipated or obvious. For example, TABLE IV and FIG. 5 in the '023 reference (Col. 22 line 47-55) shows that the mixed metal oxide has an attrition resistance and ABD that differs from an HTL:

TABLE IV

HTL Composition	Attrition Index (ASTM)	*ABD (g/cc)
2 Mg/1Al (Step 1 Activation)	3.9	0.39
2 Mg/1Al (Step 2 Activation)	0.54	0.96
5 Mg/1Al (Step 1 Activation)	15	0.36
5 Mg/1Al (Step 2 Activation)	0.65	0.75

\*Apparent Bulk Density

As shown in patent '023 Table IV, "2 Mg/1Al (Step 1 Activation)" line 1 with Attrition Index 3.9 and 0.39 is an embodiment of the mixed metal oxide in pending claims. The composition "2 Mg/1Al" (Step 2 Activation)" 2<sup>nd</sup> line with Attrition Index 0.54 and 0.96 ABD is an embodiment of HTL. The composition with "5 Mg/1Al (Step 1 Activation)" 3<sup>rd</sup> line with Attrition Index 15 and 0.36 ABD is another embodiment of the mixed metal oxide. The composition with "5 Mg/1Al (Step 2 Activation)" 4<sup>th</sup> line with Attrition Index 0.65 and 0.75 ABD is another embodiment of an HTL. Thus, '023 reference, with multiple examples, shows that the mixed metal oxide has a different Attrition Index and ABD than HTL, and hence are not the same compositions, each characteristic which independently refute that the present claims are anticipated or obvious.

TABLE V in the '023 reference shows:

Table V

HTL Composition	Attrition Index (ASTM)	*ABD (g/cc)
2 Mg/1Al (Step 1 Activation)	3.9	0.96
2 Mg/1Al (Step 2 Activation)	0.54	0.96
2 Mg/1Al (Additional heat to 732°C./hr.)	0.81	0.80

TABLE V in the '023 reference (Col. 22 line 47-55) shows that the mixed metal oxide has an attrition resistance and ABD that differs from a calcined HTL. The composition with "2

Mg/1Al" 3<sup>rd</sup> line with Attrition Index 0.81 and 0.80 ABD is an embodiment of a calcined HTL. Thus, '023 reference shows that the mixed metal oxide has a different Attrition Index and ABD than calcined HTL, and hence are not the same compositions, each characteristic which independently refute that the present claims are anticipated or obvious. Thus, '023 reference Tables IV and V shows that the mixed metal oxide has a different Attrition Index and ABD than HTL and calcined HTL, and hence are not the same compositions.

Thus, '023 alone or in view of Stamires do not disclose *using a mixed metal oxide* in general and not in an FCC unit:

- 1) "Mixed metal oxide" is not and cannot be the same composition as an HTL, calcined HTL or precursor of Stamires, based on multiple characteristics which differ from an HTL, calcined HTL or precursor of Stamires, such as Attrition Index and ABD, X-ray diffraction pattern, degree of gasoline sulfur reduction, product yield, and yield shift. Each characteristic independently shows that the mixed metal oxide is not and cannot be the same composition as a HTL, calcined HTL or precursor of Stamires.
- 2) '023 alone or in view of Stamires does not disclose *using the mixed metal oxide* in an FCC unit. Nor do '023 alone or in view of Stamires disclose using a mixed metal oxide in an FCC unit to reduce gasoline sulfur, etc. and Stamires does not even disclose the mixed metal oxide.
- 3) Thus, reducing gasoline sulfur emissions from a FCC unit or cracking unit with a mixed metal oxide is not and cannot be inherent or obvious because HTL, calcined HTL, or precursor of Stamires are different from a mixed metal oxide (as discussed above) and '023 does not disclose using the mixed metal oxide for such uses and hence the mixed metal oxide is not and cannot be in the FCC unit or cracking unit to necessarily, inherently or obviously reduce gasoline sulfur. In other words, reducing gasoline sulfur emissions from an FCC unit or cracking unit with a mixed metal oxide is not and cannot be inherent when the mixed metal oxide is not in the FCC unit or cracking unit and when the references do not suggest using the mixed metal oxide or as in Stamires, does not even disclose the mixed metal oxide. Thus, a new method for reducing gasoline sulfur with a mixed metal oxide is not inherent or obvious over '023 alone or in view of Stamires and is patentable because new method or use of a compound is patentable.

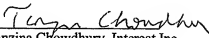


Consequently, Applicant respectfully submits that independent claims 57, 77, 100, and 104 are not anticipated, inherent or obvious. As current independent claims are allowable, all the dependent claims which depend from the respective independent claims are also allowable.

Applicant respectfully requests an Examiner interview and or submits that the present amendment places the application in condition for allowance. The Director is hereby authorized to charge any payments that may be due in connection with this reply to Wilmer Cutler Pickering Hale and Dorr LLP Deposit Account No. 08-0219.

Respectfully submitted,

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